Direct Synthesis of an Iridium(III) Bipyridine Metal–Organic Framework as a Heterogeneous Catalyst for Aerobic Alcohol Oxidation

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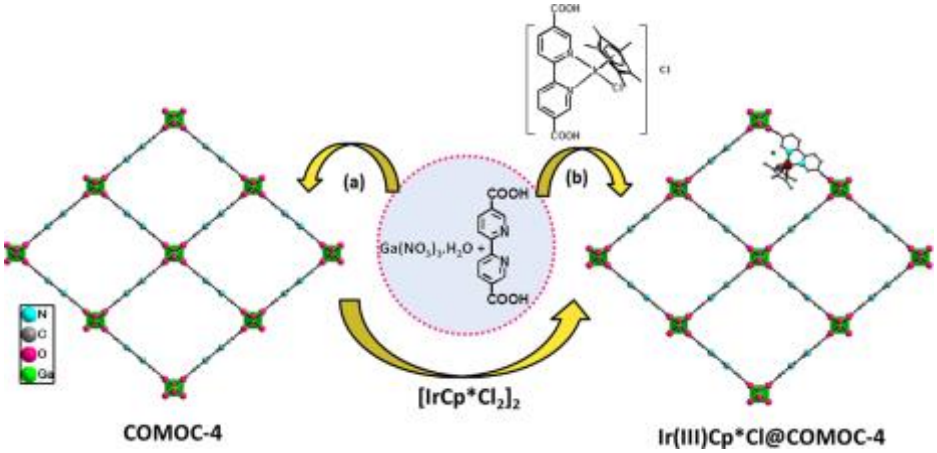
Metal Organic Frameworks (MOFs) are crystalline porous materials constructed from metal ions or metal clusters interconnected by rigid organic linkers. MOFs have been examined in gas sorption and separation, sensing, luminescence and in catalysis[1]. In this study we present the successful immobilization of the $[IrCp^*Cl_2]_2$ complex (Cp^*=1,2,3,4,5-pentamethylcyclopentadienyl) by two different routes (post- and prefunctionalization, see scheme 1)[2]. The obtained Ir based MOF materials were compared in terms of the Ir loading, specific surface area, and crystallinity. In this case, the prefunctionalization approach was a powerful way to obtain a high Ir loading and surface area and preserve the formation of the desired MOF topology. Additionally, the $Ir^{III}Cp^*Cl$@COMOC-4 was evaluated as a catalyst in the oxidation of benzyl alcohol employing O_2 as oxidant. The $Ir^{III}Cp^*Cl$@COMOC-4 exhibited a comparable or even higher catalytic performance in comparison to other homogeneous Ir-based catalysts. Furthermore, the stability and reusability was examined which showed that the $Ir^{III}Cp^*Cl$@COMOC-4 material could be reused for at least four cycles with no decrease in activity and selectivity. Additionally, no significant leaching of the Ir and Ga species or loss of the crystallinity was observed.



Scheme 1. Schematic illustration for the preparation of $Ir^{III}Cp^*Cl$@COMOC-4 by a) postfunctionalization and b) prefunctionalization.

[1] Leus K, Liu, YY, Van Der Voort P, Catalysis Reviews-Science and Engineering, 56 (2014) 1.

[2] Abednatanzi S, Derakhshandeh PG, Abbasi A, Van Der Voort P, Leus K, ChemCatChem, 2016, DOI: 10.1002/cctc.201600985.

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